

SUMMARY OF FIRE PROTECTION PROGRAMS FOR CALENDAR YEAR 2001



UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF SAFETY AND HEALTH (EH-5)
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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) continues the series started in 1972.

Since May 1950, an Annual Fire Protection Program Summary (Annual Summary) has been submitted by DOE's fire protection engineering community under the requirements of DOE's predecessor agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). An Annual Summary is currently required by section 5a.(8) of DOE Order 231.1, "Environment, Safety and Health Reporting" which replaced DOE 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements".

Accident reports required by DOE Order 231.1 are compiled within the Computerized Accident Incident Reporting System (CAIRS) from different field organization sources than those submitting the Annual Summary. Each quarter, CAIRS issues the Occupational Injury and Property Damage Summary which statistically reports on DOE loss topics such as fatalities, injuries, illnesses, fire, and non-fire losses. The Annual Summary however, takes a more comprehensive look at the DOE fire protection program. Fire loss statistics are provided, as are reports on a broad range of fire protection activities including; automatic suppression system performance, fire department responses, and the recurring cost of fire protection at DOE sites. Fire loss statistics from the Annual Summary are also validated with the CAIRS fire loss reports, and trended against the CAIRS non-fire loss data. Discrepancies with either loss statistic are investigated and corrected as necessary.

The report for calendar year (CY) 2001 was summarized from information sent to Headquarters by 44 out of 59 reporting elements, representing approximately 82 percent of DOE's holdings. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 21 categories represented. Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

In 1999, an initiative was undertaken to automate the Annual Summary reporting process to streamline data collection and provide a more thorough review of DOE Reporting Element activities. This action resulted in the delayed publication of the CY 1999 and 2000 reports until 2002. It is now possible however to view all Annual Summary Reporting Element responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels. Additionally, a built-in reference to other DOE reporting activities (CAIRS and ORPS) is available that allows Reporting Elements and managers the opportunity to review all fire protection events along previously mentioned categories. For example, the information contained in this publication was extracted from the Annual Summary Application at the Headquarters level for CY 2001. To obtain a copy of the Annual Summary Application please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH-53) at 301.903.6542 or jim.Bisker@hq.doe.gov.

GLOSSARY

Field organization abbreviations:

AL	Albuquerque Operations
CAO	Carlsbad Area Office
CH	Chicago Operations
FETC	Federal Energy Technology Centers
GFO	Golden Field Office
HQ	Headquarters (DOE)
ID	Idaho Operations
NPR	Naval Petroleum Reserves
NV	Nevada Operations
OK	Oakland Operations (California)
OFO	Ohio Field Office
ORO	Oak Ridge Operations
ORP	Office of River Protection
PA	Power Administrations ¹
PNR	Pittsburgh Naval Reactors Office
RF	Rocky Flats Operations
RL	Richland Operations
SNR	Schenectady Naval Reactors Office
SPR	Strategic Petroleum Reserves ²
SR	Savannah River Operations
YM	Yucca Mountain Site Characterization Project Office

Site abbreviations:

ALA	Ames Laboratory
ANLW	Argonne National Laboratory, West
ANLE	Argonne National Laboratory, East
AEMP	Ashtabula Environmental Management Project
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
ETTP	East Tennessee Technology Park
EML	Environmental Measurements Laboratory
FNAL	Fermi National Accelerator Laboratory
FEMP	Fernald Environmental Management Project
GJO	Grand Junction

1. Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA); Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

² Strategic Petroleum Reserve Sites include: Bayou Choctaw, Big Hill, Bryan Mound and West Hackberry.

HAN	Hanford Site ³
INEEL	Idaho National Engineering & Environmental Laboratory
ITRI	Inhalation Toxicology Research Institute
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
KSO	Kesserling Site
LBL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratories
LANL	Los Alamos National Laboratories
MEMP	Miamisburg Environmental Management Project
MGN	Morgantown Federal Energy Technology Center
NREL	National Renewable Energy Laboratory ⁴
NRF	Naval Reactor Facilities
NTS	Nevada Test Site ⁵
NBL	New Brunswick Laboratory
ORISE	Oak Ridge-Institute of Science & Education
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant ⁶
PNL	Pacific Northwest Laboratory
PGH	Pittsburgh Federal Energy Technology Center
POR	Portsmouth Gaseous Diffusion Plant ⁴
PPPL	Princeton Plasma Physics Laboratory
ROSS	Ross Aviation, Inc.
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
TJNL	Thomas Jefferson National Accelerator Facility
WIPP	Waste Isolation Pilot Plant
WSS	Weldon Spring Site
WVDP	West Valley Demonstration Project
WS	Windsor Site
Y-12	Y-12 Plant
YM	Yucca Mountain Project

The below reference is used throughout the report to identify various DOE elements:

DOE field organization (abr.)/Site(abr.)

Example: AL/LANL

³ Hanford Site includes the Pacific Northwest National Laboratory

⁴ National Renewable Energy Laboratory includes the Wind Site

⁵ Nevada Test Site Includes: Amador Valley Operations, Las Vegas Operations, Nevada-Los Alamos Operations, Nevada-Special Technology Laboratory, Washington Aerial Measurements Operation, and Nevada-EG&G Wolburn NV.

⁶ On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC) essentially transferring all ownership responsibilities to USEC.

DEFINITIONS

The following terms are defined in the text of DOE Manual M 231.1-1, "Environment, Safety, and Health Reporting Manual." Major definitions not included in this manual have been extracted from the rescinded order DOE 5484.1 to clarify key concepts. Section references to these documents are given at the end of the definition.

1. **Property Value:** The approximate replacement value of all DOE-owned buildings and equipment. Included are the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Excluded are the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (APPENDIX C, DOE M 231.1)
2. **Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is in fact performed. The estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage, (3) any reductions for salvage value, and (4) any lost revenue experienced as a result of the accident. The estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property is not reportable, even if DOE is liable for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and non-fire loss events. (APPENDIX C, DOE M 231.1)
3. **Fire Loss:** All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off. (APPENDIX C, DOE M 231.1)
4. **Non-fire Loss:** All damage or loss sustained as a consequence of the following events: (1) explosions; (2) natural cause events (such as earthquakes and hurricanes); (3) electrical malfunctions; (4) transportation (cargo) losses; (5) mechanical malfunctions; (6) radiation releases or other nuclear accidents; and (7) miscellaneous accidents (such as thermal, chemical or corrosion-related accidents). (CHAPTER 4.2.c, DOE 5484.1)
5. **Loss Rate:** Unit of comparison in cents loss per \$100 of property value.

EXECUTIVE SUMMARY

DOE experienced no fatalities or major injuries from fire in CY 2001. However, 93 fire events were reported during the period causing an estimated \$287,263 in property damage. These losses are approximately \$102,574,020 less than fire losses sustained in CY 2000, with 65 percent of loss attributed to 5 incidents.

Loss comparisons between the DOE and private industry are performed by normalizing data against total property value. In CY 2001 CAIRS reported an increase in property valuations over the previous year by 0.7 percent to 103.2 Billion dollars. The CY 2001 fire loss rate is therefore approximately 0.03 cents for each \$100 in property value. This rate is 2.04 cents lower than the five year DOE average, and 0.64 cents lower than insurance industry (non-nuclear) statistics.

Recurring costs for fire protection exceeded 134 million dollars in CY 2001. On a ratio of cost to total property value, the DOE spent approximately 13.04 cents per \$100 in property value for recurring fire protection activities or, 0.19 cents more than the previous year.

In CY 2001, three fires were controlled by automatic fire suppression sprinkler systems (non water based). The success of these systems were, however, offset by the inadvertent actuation of 43 systems primarily due to unspecified causes (13 events). Also, concerns remain regarding inadvertent Halon discharges (3 of the above 43 events), causing the release of approximately 1419 pounds of Halon to the environment. DOE remains committed to minimizing this ozone depleting substance through implementation of its managed Halon phaseout guidelines.

DOE PROPERTY LOSS EXPERIENCE

Property value estimates are taken from the CAIRS database and serve as a common denominator for comparing Annual Summary loss rates to the CAIRS Summary. CAIRS data shows that DOE property values increased approximately 0.7 percent in CY 2001.

In all, 93 fire incidents were reported by field organizations accounting for a total year-end fire loss of \$287,263. Of these incidents, 80 fires were reported as falling below the CAIRS threshold of \$5,000. Field organizations reported through CAIRS, non-fire loss amounts totaling \$218,323.

DOE's fire loss rate for CY 2000, as summarized from field organization reports, is approximately 0.03 cents loss per \$100 property value; 360 times lower than last year's 10.034 cent figure. This statistic is also 74 times lower than the 1996-2000 DOE average of 2.07, beginning a new downward trend in fire loss rates over previous years. By comparison, the five year loss rate average for the highly protected risk (HPR) insurance industry was about 0.64 cents per \$100 value⁷.

⁷. As reported by an HPR insurance company for standard business property loss from fires and explosions (1997).

Fire Protection Summary
For Calendar Year 2001

Table 1 characterizes Annual Summary loss histories since 1950 and includes both fire and non-fire loss rate categories. Numbers shown in parentheses represent a 5-year running average, where applicable. The accompanying figures are described as follows:

Figure 1 - graphical representation of the Department's property valuation since 1950

Figure 2 - fire and non-fire property loss since 1981

Figure 3 - fire loss rates since 1986

Figure 4 - non-fire loss rates over the same time period

Figure 5 - the current year's fire event tally by Field Organizations

Figure 6 - the current year's fire loss (dollars) by Field Organizations

Figure 7 - the current year's fire loss rate by Field Organizations

Figure 8 - the current year's non-fire event tally by Field Organizations

Figure 9 - the current year's non-fire loss (dollars) by Field Organizations

Figure 10 - the current year's non-fire loss rate by Field Organizations

Organizations not shown on Figures 5 through 10 reported either insignificant or zero losses for the year.

Trending of fire loss data indicates that a small number of incidents constitute the majority of dollar losses reported to the DOE. For example, 5 fire incidents accounted for approximately 65 percent of the total dollar loss amount.

The largest fire and non-fire losses for the year are noted below:

1. RL/ HAN – A fire occurred in an electrical panel in room 235-B of building 234-5Z. The HFD responded to the scene and extinguished the fire. Damage estimate - \$57,000. CAIRS No.: 2001061.
2. SNR/KAPL (KSO) – The mechanical separator of the breathing air compressor catastrophically failed with no personnel in the immediate area. When the failure took place, the unit was under approximately 5300 psi, this pressure caused the parts of the unit to disperse themselves in various directions inflicting damage to other components of the system and minor damage to the building walls and minor damage to the back-up light of the fire apparatus that was housed nearby. A catastrophic failure of an aluminum mechanical separator on a breathing air system was experienced while operating at a normal air pressure of approximately 5300 psi. The mechanical separator is part of an air purification system installed on an Eagle Breathing Air System. This resulted in splitting the separator housing in half. Damage estimate - \$42,165. CAIRS No.: 2001061

The 2001 fourth quarter CAIRS report identified 2 fire incidents over the year resulting in a loss of \$66,785; approximately \$220,000 less than the Annual Summary. Most of this difference, can be traced to 11 incidents which were not incorporated into the CAIRS database. The CAIRS report also lists 11 non-fire incidents producing losses of \$218,323. ORPS identifies a total of 46 fire events over CY 2001 in which fire exceeded the minimum 10- minute reporting threshold.

This report has historically identified discrepancies between Annual Summary field reports and that of either CAIRS or ORPS databases. In many instances, these discrepancies were traced to either: reporting threshold differences, delayed reporting, cost estimating differences, improper loss characterization, or a

misinterpretation on the need to file a report at all. Since loss statistics from CAIRS and ORPS are often extracted for use in other documents such as reports to Congress, performance indicator studies, and media releases, an incomplete reflection of DOE fire loss history is often the result. Database administrators are addressing these issues by increased field training programs and by streamlining the reporting process using state of the art electronic technology. A part of this technology includes developing a "seamless" approach using a library of definitions that allows the sharing of data across multiple database applications.

Fire Protection Summary
For Calendar Year 2001

Table 1
DOE Loss History From 1950 To Present

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Non-fire Loss (Dollars)	Loss Rates (cents per 100 Dollar Value)		
				Fire*	Non-Fire*	Total*
50	1,800.00	486,389	10,050	2.70 -	0.06 -	2.76 -
51	2,177.10	38,318	317,797	0.18 -	1.46 -	1.64 -
52	3,055.10	449,107	356,600	1.47 -	1.17 -	2.64 -
53	4,081.00	148,142	427,430	0.36 -	1.05 -	1.41 -
54	6,095.90	185,438	190,436	0.30 -	0.31 -	0.62 -
55	6,954.20	125,685	330,103	0.18 (1.00)	0.47 (0.81)	0.66 (1.81)
56	7,364.10	2,206,478	940,945	3.00 (0.50)	1.28 (0.89)	4.27 (1.39)
57	7,973.20	590,663	885,936	0.74 (1.06)	1.11 (0.86)	1.85 (1.92)
58	8,102.50	275,560	476,265	0.34 (0.92)	0.59 (0.84)	0.93 (1.76)
59	10,301.80	199,841	998,060	0.19 (0.91)	0.97 (0.75)	1.16 (1.67)
60	10,708.60	636,228	764,823	0.59 (0.89)	0.71 (0.88)	1.31 (1.77)
61	11,929.90	325,489	5,530,566	0.27 (0.97)	4.64 (0.93)	4.91 (1.91)
62	12,108.80	3,020,023	293,341	2.49 (0.43)	0.24 (1.60)	2.74 (2.03)
63	13,288.90	599,056	776,998	0.45 (0.78)	0.58 (1.43)	1.04 (2.21)
64	14,582.80	480,519	870,516	0.33 (0.80)	0.60 (1.43)	0.93 (2.23)
65	15,679.30	1,743,448	2,106,621	1.11 (0.83)	1.34 (1.35)	2.46 (2.18)
66	16,669.00	158,220	698,753	0.09 (0.93)	0.42 (1.48)	0.51 (2.41)
67	17,450.90	359,584	2,423,350	0.21 (0.90)	1.39 (0.64)	1.59 (1.53)
68	18,611.90	155,986	713,097	0.08 (0.44)	0.38 (0.87)	0.47 (1.31)
69	20,068.30	27,144,809	909,525	13.53 (0.37)	0.45 (0.83)	13.98 (1.19)
70	22,004.30	89,456	1,611,336	0.04 (3.00)	0.73 (0.80)	0.77 (3.80)
71	24,155.80	78,483	1,857,566	0.03 (2.79)	0.77 (0.68)	0.80 (3.47)
72	26,383.50	222,590	698,061	0.08 (2.78)	0.26 (0.75)	0.35 (3.52)
73	27,166.70	117,447	2,258,241	0.04 (2.75)	0.83 (0.52)	0.87 (3.27)
74	28,255.50	249,111	930,766	0.09 (2.75)	0.33 (0.61)	0.42 (3.36)
75	31,658.30	766,868	4,485,481	0.24 (0.06)	1.42 (0.59)	1.66 (0.64)
76	35,512.70	251,849	2,040,727	0.07 (0.10)	0.57 (0.72)	0.65 (0.82)
77	39,856.10	1,084,823	2,529,161	0.27 (0.11)	0.63 (0.68)	0.91 (0.79)
78	47,027.10	12,976,036	4,501,943	2.76 (0.14)	0.96 (0.76)	3.72 (0.90)
79	50,340.80	654,716	1,886,307	0.13 (0.69)	0.37 (0.78)	0.50 (1.47)
80	54,654.70	1,385,686	7,160,249	0.25 (0.69)	1.31 (0.79)	1.56 (1.49)
81	59,988.80	2,042,633	2,600,855	0.34 (0.70)	0.43 (0.77)	0.77 (1.47)
82	65,360.40	948,691	3,252,277	0.15 (0.75)	0.50 (0.74)	0.64 (1.49)
83	70,484.40	731,234	9,765,828	0.10 (0.73)	1.39 (0.71)	1.49 (1.44)
84	82,166.90	1,549,807	4,917,513	0.19 (0.19)	0.60 (0.80)	0.79 (0.99)
85	86,321.84	1,145,975	2,983,322	0.13 (0.21)	0.35 (0.85)	0.48 (1.05)
86	82,787.52	805,030	4,490,262	0.10 (0.18)	0.54 (0.65)	0.64 (0.83)
87	91,927.20	1,570,736	1,440,093	0.17 (0.13)	0.16 (0.67)	0.33 (0.81)
88	92,998.00	466,120	7,837,000	0.05 (0.14)	0.84 (0.61)	0.89 (0.74)
89	107,948.00	615,551	6,890,000	0.06 (0.13)	0.64 (0.50)	0.70 (0.63)
90	115,076.00	8,392,746	9,078,000	0.73 (0.10)	0.79 (0.51)	1.52 (0.61)
91	118,868.68	608,740	1,820,065	0.05 (0.22)	0.15 (0.59)	0.20 (0.81)
92	118,267.06	1,166,858	2,486,696	0.10 (0.21)	0.21 (0.52)	0.31 (0.73)
93	119,826.25	679,939	2,338,595	0.06 (0.20)	0.19 (0.53)	0.25 (0.73)
94	124,350.29	1,533,717	1,869,933	0.12 (0.20)	0.15 (0.40)	0.27 (0.60)
95	120,321.68	720,720	911,746	0.06 (0.21)	0.08 (0.30)	0.14 (0.51)
96	113,471.00	2,372,482	3,653,350	0.21 (0.08)	0.32 (0.16)	0.53 (0.24)
97	102,947.24	544,924	5,567,963	0.05 (0.11)	0.54 (0.19)	0.59 (0.30)
98	99,127.79	316,475	1,062,313	0.03 (0.10)	0.11 (0.26)	0.14 (0.36)
99	110,858.47	443,049	2,467,991	0.04 (0.10)	0.22 (0.24)	0.26 (0.34)
00	102,514.01	102,861,283	312,839	10.03 (0.08)	0.03 (0.25)	10.06 (0.33)
01	103,215.56	287,263	218323	0.03 (2.07)	0.02 (0.25)	0.05 (2.32)

*Numbers shown in parentheses represent the 5-year running average.

Figure 1
DOE Property Valuation

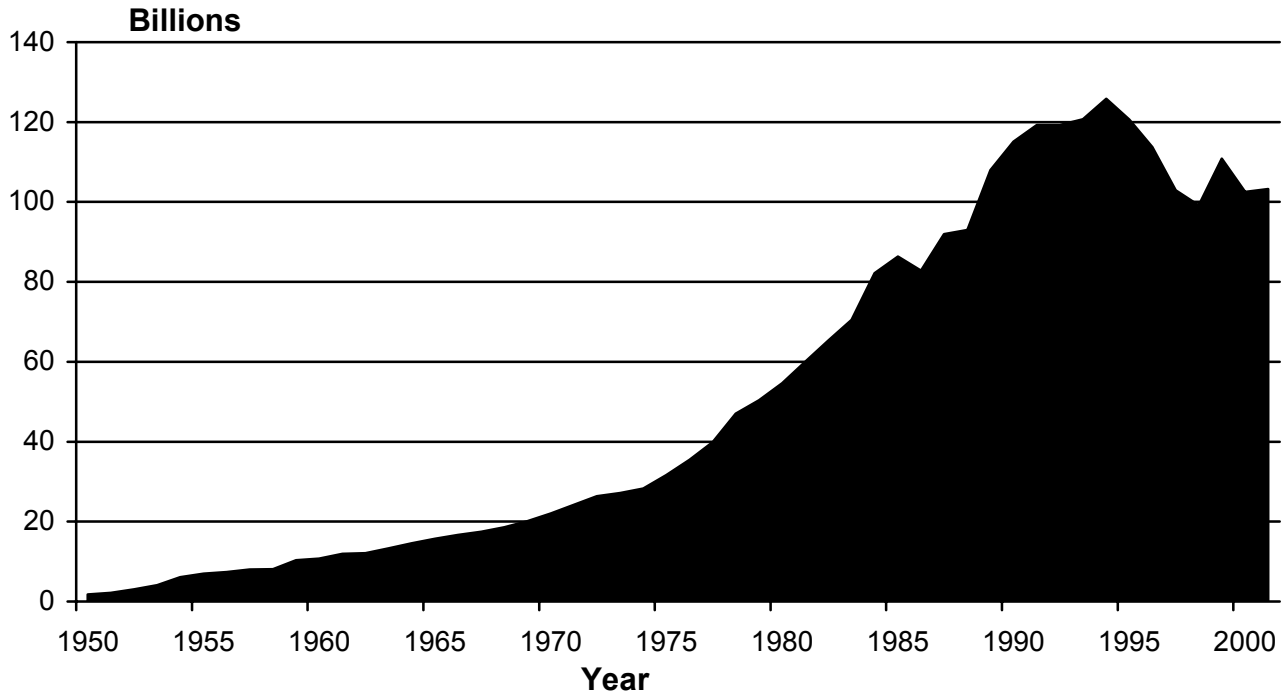


Figure 2
Property Loss

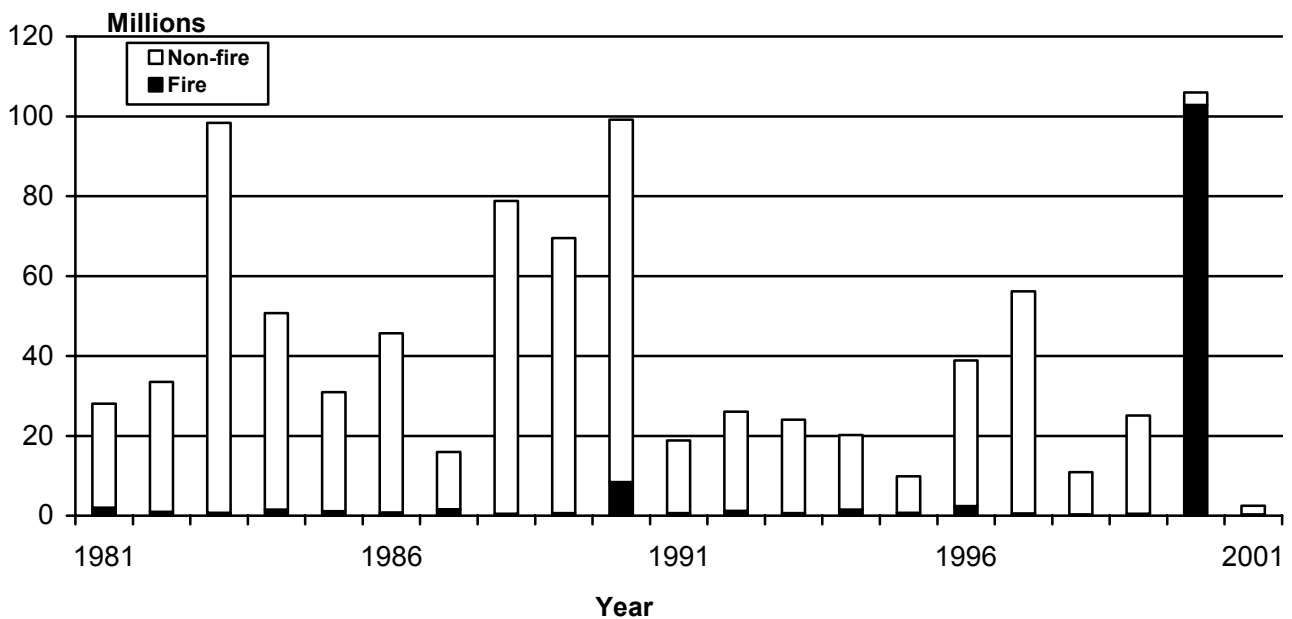


Figure 3
DOE Fire Loss Rate

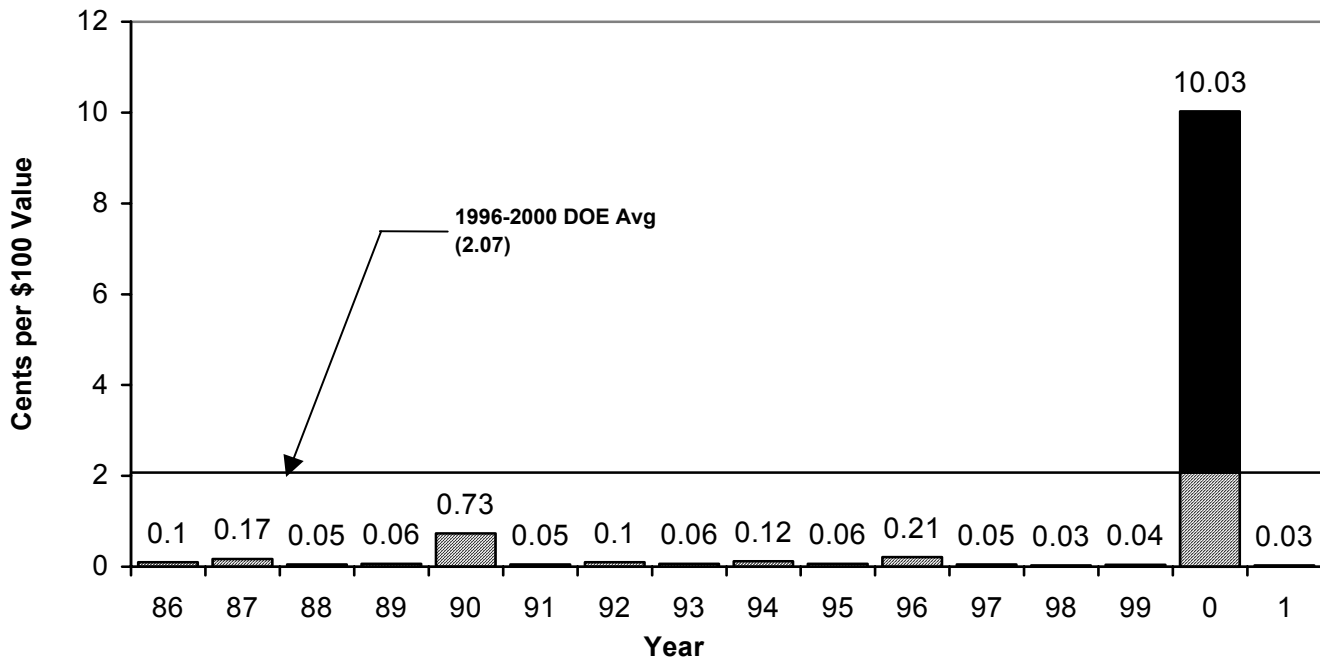


Figure 4
DOE Non-fire Loss Rate

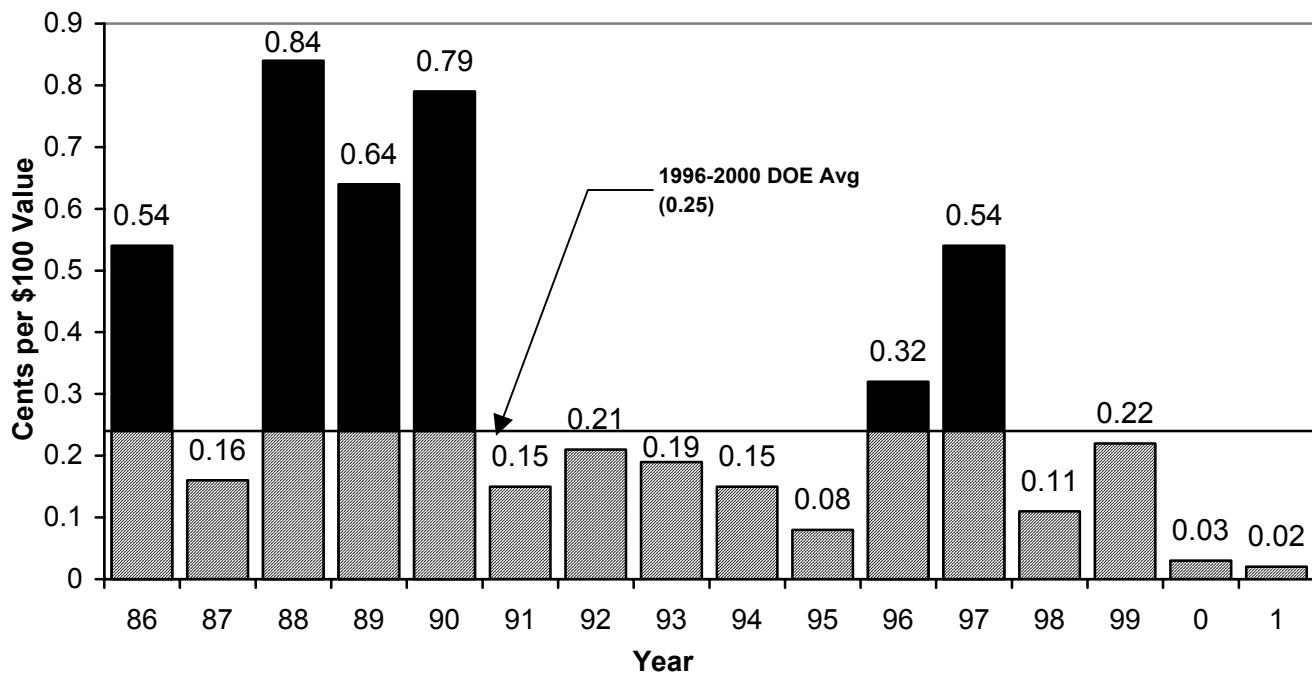


Figure 5
Fire Events by Field Organization

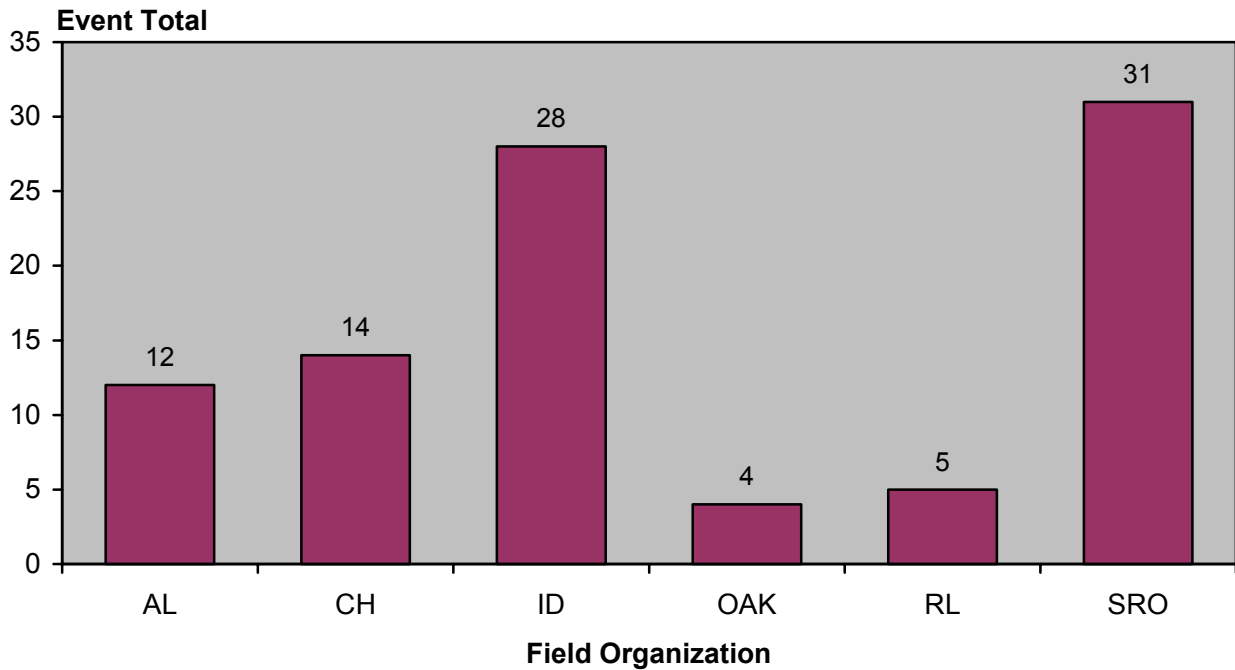


Figure 6
Fire Loss Amount by Field Organization

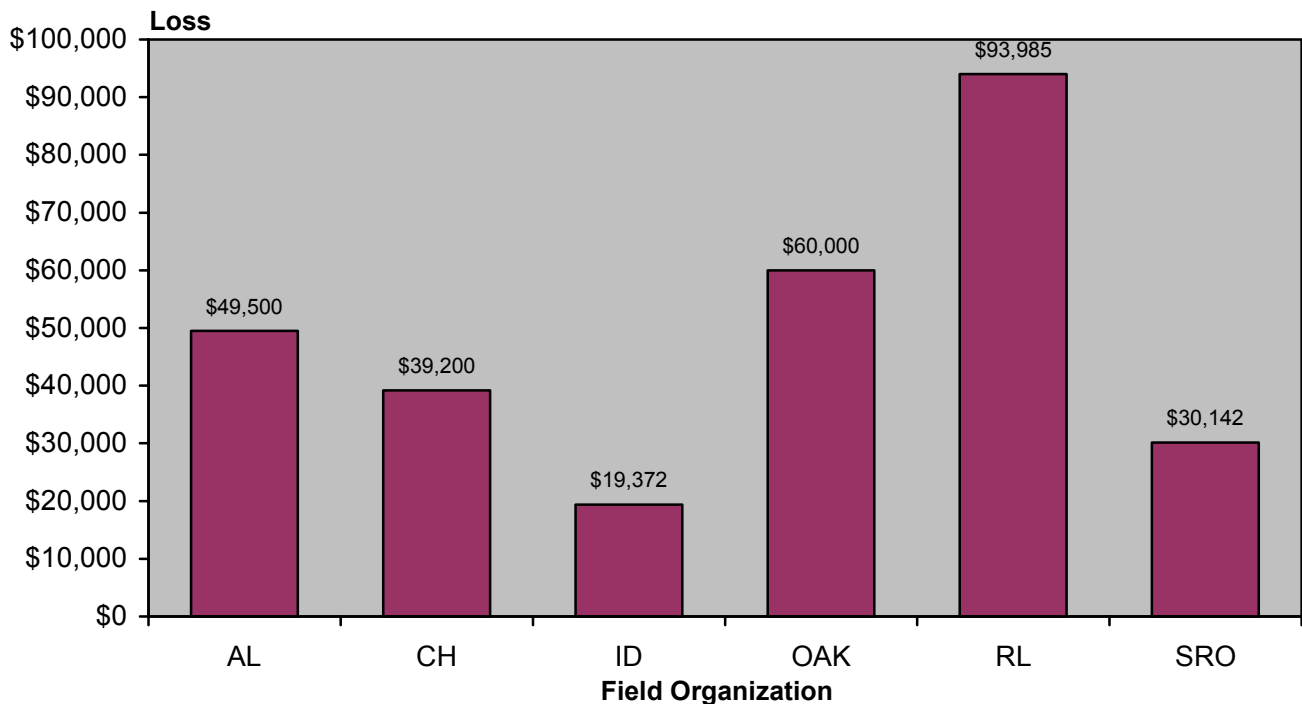


Figure 7
Fire Loss Rate by Field Organization

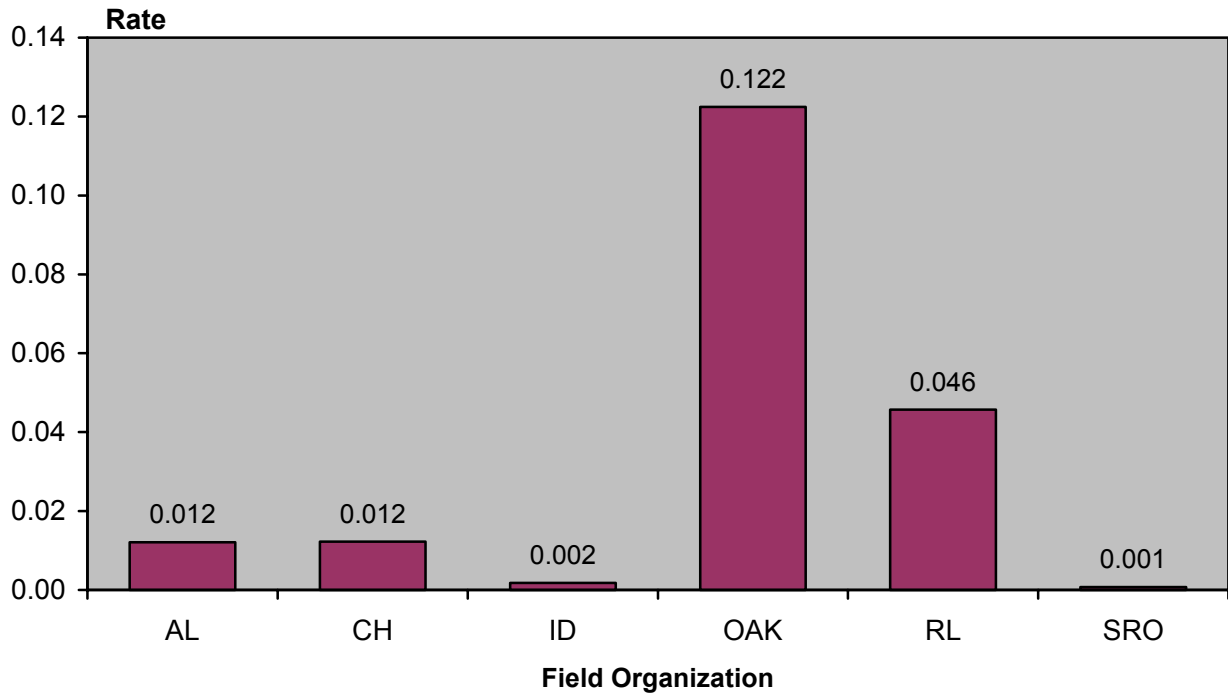


Figure 8
Non-fire Loss Events by Field Organization

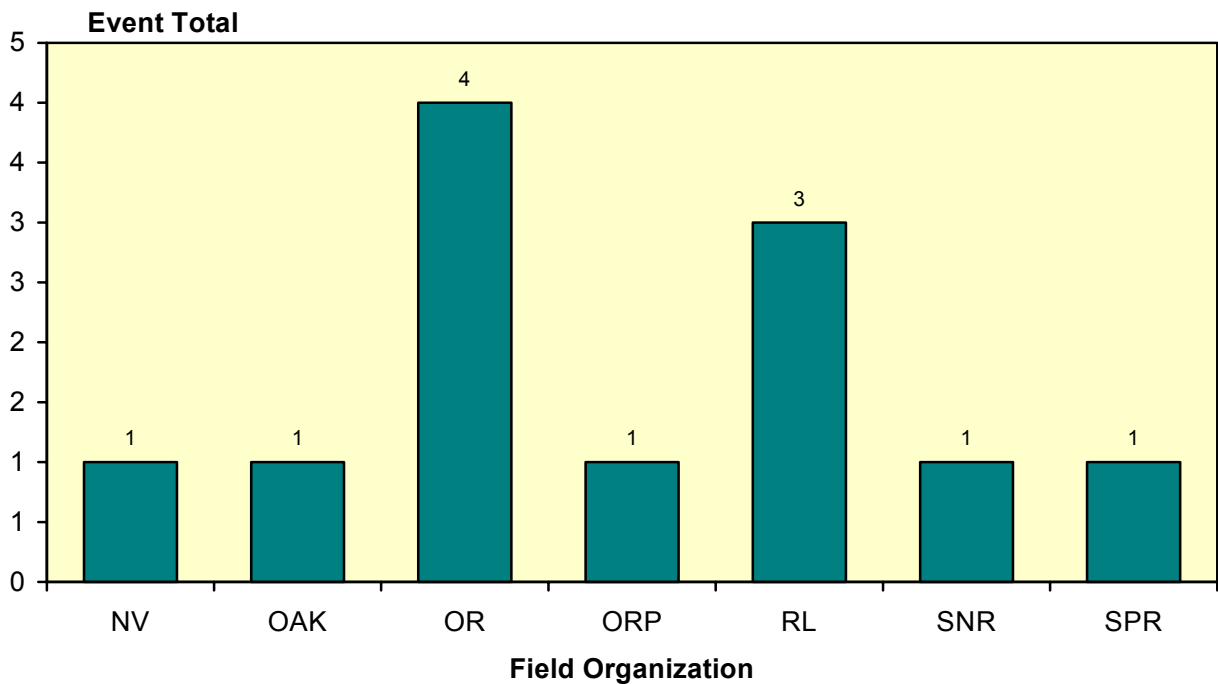


Figure 9
Non-fire Loss Amount by Field Organization

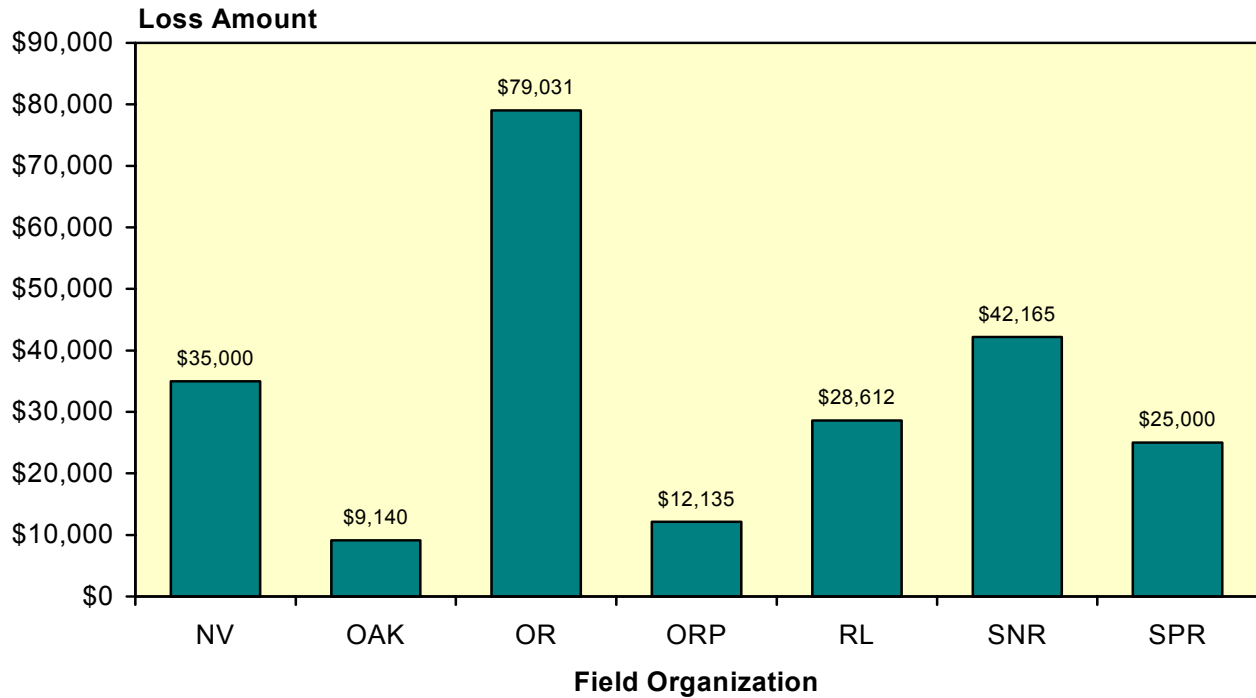
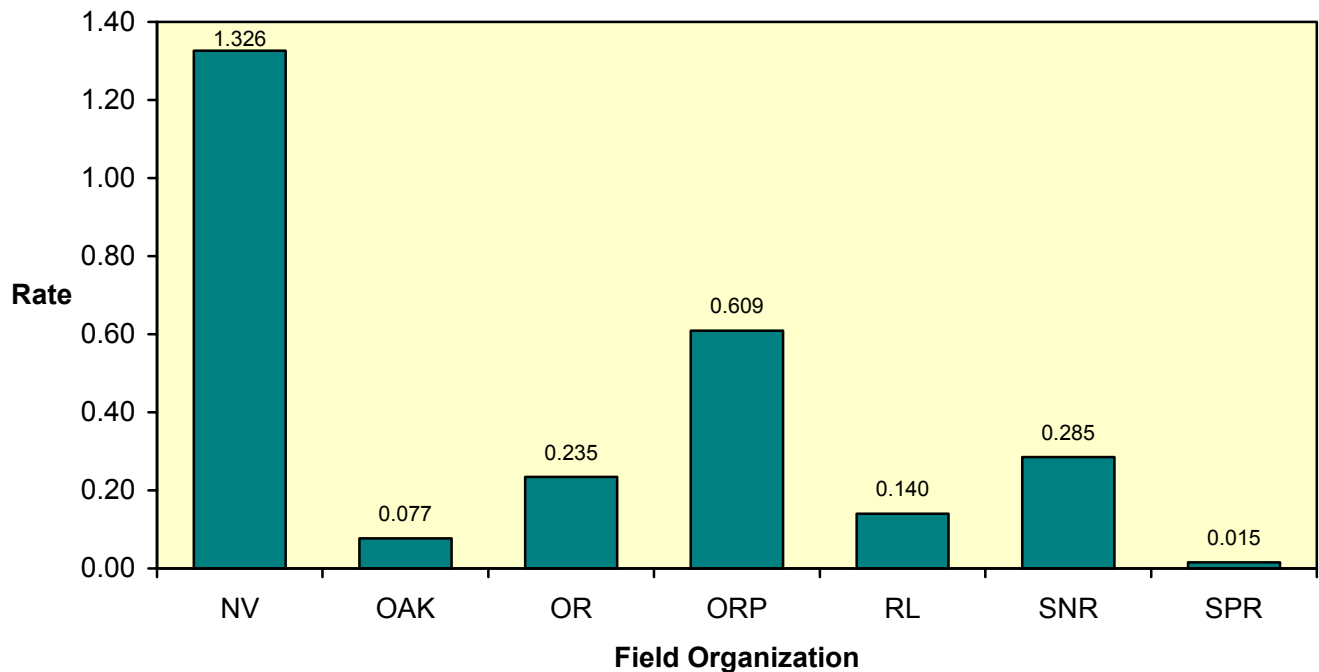


Figure 10
Non-fire Loss Rate by Field Organization



SUMMARY OF FIRE DAMAGE INCIDENTS

The following table provides a description major DOE fire losses over the year. See Tables 3 and 6 for fire events involving fixed automatic fire suppression systems:

Table 2: Summary of Fire Damage Incidents			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire/Smoke (Building)	RL / HAN	A fire occurred in an electrical panel in room 235-B of building 234-5Z. The HFD responded to the scene and extinguished the fire. CAIRS No.: 2001061	\$57,000.00
Fire/Smoke (Building)	OAK / SLAC	Klystron Gallery , Sector 16, a fire in the modulator metal cabinet , it took the fire fighters 10 minutes using a large wheeled CO2 fire extinguisher to extinguish the fire.	\$50,000.00
Fire/Smoke (Building)	CH / ANLE	Building 952 - Child Development Center. The facility is located off-site adjacent to the Laboratory. An arsonist placed combustibles next to the building's main entrance and set them on fire during the early morning hours. A passerby reported the fire via cell phone. Argonne and neighboring fire departments responded and were able to hold the fire loss to the building's exterior. The DuPage County Sheriff's Department handled the investigation.	\$38,000.00
Fire/Smoke (Vehicle)	AL / SNL	SNLA - The Tonopah Test Range (TTR) experienced a security vehicle fire. The TTR Security Communicator was immediately notified and the communicator dispatched the necessary personnel to extinguish the fire and to begin the investigation of its cause. The fire was quickly extinguished with no injuries occurring and without an adverse environmental impact. Fire was discovered in the engine compartment and in the cab on the driver's seat. The preliminary investigation discovered burnt weeds and brush that had accumulated underneath the catalytic converter skid plate area. It appeared that heat from the catalytic converter initiated combustion of the accumulated material. Due to the initial results of the preliminary investigation, all security vehicles' undercarriages were immediately inspected and cleaned. Security enacted a new policy requiring all security vehicles returning from off-road patrols shall have their undercarriages inspected and cleaned if necessary. The vehicle was declared a total loss by Government Services Administration (GSA) Fleet management.	\$23,000.00
Fire/Smoke (Building)	RL / HAN	Project change trailer (HO-64-5864) had extensive smoke and heat damage from a heater failure. CAIRS No.:2001010	\$18,000.00
Fire/Smoke (Building)	SRO / SRS	At 09:49, SRSFD personnel responded to a call-in fire alarm from 221-S. Upon arrival, fire fighters investigated and found the cause of the fire to be an electrical short in the #5 Elevator Control Motor. Power was de-energized to the equipment and the fire self-extinguished. There were no further actions on the part of the SRSFD. The elevator is temporarily out-of-service pending repair of the motor. There were no injuries.	\$15,000.00
Fire/Smoke (Building)	AL / LANL	Fire in HVAC unit. November 14, 2001, LAFD responded to a fire in HVAC unit located at TA-35-455. The fire was contained to one section of the unit. There was some localized smoke damage inside of the building. ORPS NO.: TARGETFAB-2001-0001.	\$10,000.00
Fire/Smoke (Building)	RL / HAN	Fluid in an electrochemical polishing unit caught fire in a fume hood. The unit uses an electrolytic solution of methyl alcohol and perchloric acid. The fire was extinguished with a portable dry chemical fire extinguisher. CAIRS	\$9,785.00

Table 2: **Summary of Fire Damage Incidents**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
		No.: 2001011	
Fire/Smoke (Building)	RL / HAN	Heat from operating equipment in close proximity to insulation surrounding a heat exchanger unit in a liquid nitrogen system ignited the insulation. CAIRS No.:2001065	\$7,700.00
Fire/Smoke (Other)	SRO / SRS	At 09:49, the SRSFD was dispatched to an activated detector fire alarm from 722-1A. While calibrating a dry well calibrator, the machine malfunctioned and did not cut-off at the preset temperature. As a result, an aluminum sleeve on the calibrator melted. Operators poured molten aluminum from calibrator into a pan on the bench top. The pan was sitting on some shop rags that began to smolder as a result of the heat. A facility operator using welding/heat gloves moved the pan and rags to an outdoor area. Calibrator was de-energized and taken out-of-service. There were no actions taken by the SRSFD, no injuries and the estimated cost is \$5750.	\$5,750.00
Fire/Smoke (Building)	ID / INEEL	An exit sign in the kitchen area overheated producing a crackling sound and smoke. A firefighter discharged a fire extinguisher. An investigation concluded that multiple exit signs of that particular model were susceptible to failure, needed to be replaced, and the circuit wiring inspected.	\$5,281.00
Fire/Smoke (Vehicle)	ID / INEEL	A vehicle fire was reported at approximately 20:00 hours. The INEEL fire department responded. A fire had started in the rear compartment of the station wagon. The probable ignition source of the fire was a live cigarette butt/cigarette ash which ignited a blanket covering contents in the back portion of the vehicle.	\$3,510.00

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 29 incidents were reported where water-based suppression systems operated in CY 2001: 15 were wet-pipe systems, 9 dry-pipe, 3 deluge, and 2 pre-action. Of the wet-pipe system activations, no events were directly related to fire. System activations were caused by the following events: employee related (7), design/material related (7), weather related (5), procedure related (1), and unspecified/other related (9).

Water-based system activations of interest are listed in Table 3.

Table 3: **Water Based System Actuations**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	AL / SNL	Sandia National Laboratories (SNL) Security and the Kirtland Air Force Fire Department (KAFB FD) received a water flow alarm on the Fire Protection System for Building 836. The KAFB FD responded, they performed a walkthrough of the building, and determined the building was fire safe. The Fire Alarm System continued to send the water flow alarm. At 12:00 A.M., the Incident Commanders (ICs) contacted the Fire Protection Maintenance Supervisor for support. The Sprinkler Maintenance Craftsperson responding to the problem arrived at 1:00 A.M. and determined that water was flowing in the building fire suppression system. The Sprinkler Maintenance	\$188,108.00

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Table 3: **Water Based System Actuations**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
		<p>Craftsperson confirmed with the IC that the building had been cleared by the KAFB FD and then shut off the water. Gauge readings on the sprinkler riser indicated there was still water flowing in the sprinkler system. The Sprinkler Maintenance Craftsperson and the IC conducted a walkthrough of the building looking for a possible water leak. A leak was identified in a 3" sprinkler line coupling located above the ceiling in the southeast section of the second floor.</p> <p>The area had approximately 1 1/2 inches of water and had sustained damage to the ceiling tiles, carpet, miscellaneous office equipment, documents, and computers. The water had also penetrated the first floor into a classified vault room and office space.</p> <p>The electrical systems in the area impacted by the flooding were de-energized, actions were taken to mitigate the water damage and custodial support was called to begin clean-up. No injuries occurred during this event. Efforts are on-going to determine the equipment and programmatic cost that occurred as a result of this event. ORPS Report Number: ALO-KO-SNL-NMFAC-2001-0004</p>	
Leaks, Spills, Releases	OAK / LLNL	A single sprinkler in building 391 inadvertently discharged, causing water damage. The cause was due to a defect in the sprinkler head.	\$27,000.00
Leaks, Spills, Releases	AL / LANL	Pipe Fitter violates procedures and initiates fire suppression sprinklers. On January 24, 2001, a SSSC Pipe Fitter initiated water flow through a fire sprinkler system at TA-16-410. Damage to equipment was less than \$10,000. ORPS No.: HEMACHPRES-2001-0002.	\$10,000.00
Leaks, Spills, Releases	AL / KCP	A sprinkler head located above a steam coil activated due to heat from the steam coil when the AHU was shutdown for maintenance.	\$6,749.00
Leaks, Spills, Releases	RL / HAN	Heat from a furnace in the lab escaped through a partially opened furnace door activating a single sprinkler head located directly above the door. No ignition occurred.	\$2,600.00
Leaks, Spills, Releases	ID / INEEL	IF-655 fire sprinkler piping (freeze up) A tee on a sprinkler line located above the ceiling near the west end of the IF-603/IF-655 walkway froze and broke due to insufficient heat above the ceiling. The IF fire department responded. The piping and fitting were replaced and back in service within 4 hours.	\$872.00
Leaks, Spills, Releases	CH / FNAL	On arrival the alarm was sounding and the occupants had evacuated the portakamp complex. The panel indicated a sprinkler alarm and during further investigation it was determined a pipe had failed under trailer 165. With assistance of FES personnel, the sprinkler system was shut off and an alarm tech was requested to respond to replace the broken pipe. FD Units returned to quarters. Note: The sprinkler system was repaired and placed back in service at 1050 hours. Incident No.:010078	\$100.00

There are a total of 240 incidents in DOE records where water based extinguishing systems operated in a fire. The satisfactory rate of performance is 99.2 percent, or 238 times out of 240 incidents. The two failures during a fire were attributed to; a closed cold weather valve in 1958 controlling a single sprinkler in a wood dust collector and, a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

From the above history, DOE has experienced 112 fires that were either controlled or extinguished by the wet-pipe type of automatic suppression system. Table 4 below provides a summary on the number of sprinklers actuated to control or extinguish a fire against the number of occurrences where this event was reported. For example: 95 percent of these fires were controlled or extinguished with 4 or less sprinklers activating, 91 percent were controlled with 3 or less sprinklers activating, and so on.

The significance of this table is to highlight actual performance on systems that have been installed according to standard design practices (in this case the National Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems). By comparing the actual performance to design requirements, the designer or reviewer can get a sense of the conservativeness of the design requirement and adjust the design where necessary. Sprinkler system water containment, for example, could rely on actual performance rather than strict design practice, since no specific design criteria exist on the subject.

Table 4
**DOE Wet-Pipe Automatic Suppression Performance
1955 to 2001**

Number of Sprinklers Activated per Fire Event	Number of Events	Cumulative Total of Events	Percentage of Event	Cumulative Percentage of Events
1	79	79	71	71
2	18	97	16	87
3	5	102	5	91
4	4	106	4	95
5	2	108	2	96
6	1	109	1	97
7	2	111	2	99
8	0	111	0	99
9+	1	112	1	100

NON WATER-BASED FIRE SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFCs) and Halon on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently published rules on this regulation to include; prohibiting new Halon production, establishing container labeling requirements, imposing Federal procurement restrictions, imposing significant Halon taxes,

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issuing requirements for the approval of alternative agents, and listing essential areas where Halon protection is considered acceptable.

DOE's current policy does not allow the installation of any new Halon systems. Field organizations have been requested to aggressively pursue alternative fire suppression agents to replace existing systems and to effectively manage expanding Halon inventories. The long-term goal is the gradual replacement of all Halon systems.

In CY 2001, the DOE had 547 Halon 1301 systems in operation containing approximately 153,295 pounds of agent. Stored Halon 1301 inventory was reported at approximately 132,345 pounds⁸. Operational and stored inventory amounts for the Halon 1211 were reported at 94,251 and 21,417 pounds, respectively. Field organizations reported that 33 non-essential systems were removed from service in 2001, adding approximately 7,847 pounds to DOE's inventory.

Table 5 provides a breakdown of the five largest Halon utilizing field organizations, listing both Halon 1301 (fixed system extinguishing agent) and Halon 1211 (portable extinguishing agent). Agent Drawdown amount represents the Halon released to the environment over the calendar year. The bulk of Halon utilized within the Power Administrations⁹ is located at WAPA.

Table 5
Primary DOE Sites Utilizing Halon Suppression Systems

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (lbs.)	INVENTORY (lbs.)		ACTIVE (lbs.)	INVENTORY (lbs.)
SR*	39,974	34,190	1081	2723	803
AL	29,726	29,852	0	44,331	6,293
CH	33,122	24,447	0	18,415	224
PA	10,828	2,331	0	2,155	0
SPR	9,748	0	0	0	0
Total	123,398	90,820	1081	67,624	7,320

* Designated as DOE's Halon bank.

Comparing total (active, inventory, and banked amounts) Halon 1301 stores reported in CY 2001 (355,911 pounds) to those reported in CY 2000 (356,964 pounds) indicates that DOE's Halon supply shrunk by 1,053 pounds. Comparing this difference to the drawdown amount (1,419 pounds) leaves a discrepancy of approximately +366 pounds. This discrepancy relates to amounts lost either through leakage or accounting revisions.

Sites considering any Halon transfers outside the DOE are reminded that a Halon bank has been established so that reserve capacity can be maintained for mission essential systems in the complex that have not yet been replaced. The SR Fire Department may be contacted for further information regarding Halon transfers.

⁸ Amount excludes banked inventory at the SRS – 70,271 pounds Halon 1301, 0 pounds Halon 1211.

⁹ In CY 1996, BPA ceased reporting any losses according to DOE O 231.1. Last known Halon amounts for the BPA were 14,495 lbs. in 6 systems and are not reflected in the current DOE totals.

A total of 17 incidents were reported at DOE where Halon 1301 or other non-water based suppression systems operated in CY 2001. No sites reported any system failures during a fire. Additionally, approximately 1,419¹⁰ pounds of Halon 1301 were released in these events. A brief description of non-water based suppression system actuations is provided in Table 6 below.

Table 6: Non Water Based System Actuations			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	RL / HAN	Following a routine test of the glovebox halon fire suppression system, the system discharged to the glovebox during restoration to operational status. Reserve Halon bank placed in service. Main Halon cylinders recharged and put back on line. CAIRS No: 2001064	\$23,000.00
Fire/Smoke (Building)	AL / SNL	SNLA On Friday, at about 10:47AM, the Rhino panel in the Building 880 Computer Annex (Room 230) went into alarm. This caused the FM-200 Fire Suppression System to activate. The activation caused the release of approximately 350 pounds of FM-200 fire extinguishing agent. This alarm resulted in the evacuation of Building 880. The Kirtland Air Force Base (KAFB) Fire Department, Sandia National Laboratories (SNL) Fire Alarm Maintenance, Fire Marshall, and Emergency Management personnel responded. The building was declared fire safe and the occupants were allowed to enter the building about an hour later. The alarm and release of this gas activated several shunt trip breakers. This caused all the computers and the AC units in this room to shut down. In order to attempt to determine what caused the alarm, it was decided that all power switches inside the computer racks would be opened. Facilities then restored the main power breakers, followed by the users restoring power to the racks. The process helped lead to the discovery of a failed/smoking mother board in a Compaq Computer Slate. \$16,000 to recharge FM 200 system. Less than \$500 property damage. KAFBFD Event No.: 494, ORPS Report No. ALO-KO-SNL-15000-2001-0001	\$16,500.00
Fire/Smoke (Building)	OAK / LBL	Overhead electric power supply in Storage-Tek media storage silo caused activation of system smoke detector resulting in FM-200 discharge. Loss was limited to power supply and agent discharge	\$6,000.00
Leaks, Spills, Releases	SNR / KS	Radio Repeater Shed total flooding system discharged when a lightning strike disabled the microprocessor and subsequent capability for operation. As a result of this event, KAPL has been granted permission to remove the system from service. A detection system has been commissioned to replace this system.	\$3,000.00
Fire/Smoke (Building)	SNR / KS	The Kesselring Site (KSO) experienced a fire alarm system actuation from the MARF Interactive Display Equipment Facility in the KSO Main Fire Station. Emergency Responders responded and found all personnel were evacuated and a smoke condition present throughout the facility. A staff instructor was advised of an electrical fire in a sound amplification system in the main computer room and initiated a manual activation of the CO2 suppression system. Fire fighting personnel utilized thermal imaging equipment to locate and remove damaged equipment throughout the fire area. Damage was limited to electronic sound amplification equipment. The suppression agent had no immediate impact in regards to extinguishment.	\$1,000.00

¹⁰ The above figure does not consider system leakage in a stable condition.

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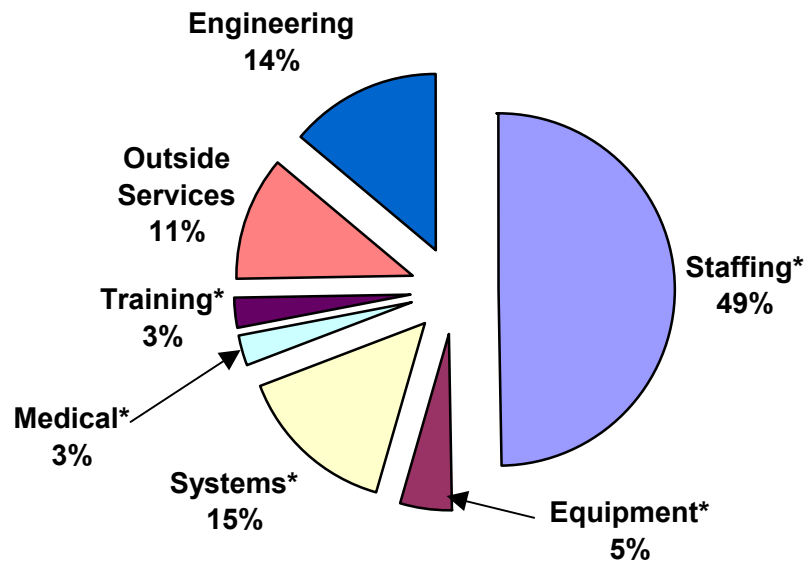
Table 6: Non Water Based System Actuations			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
		Occupant and detection system activation immediately secured power to the entire facility which prevented further fire damage.	
Leaks, Spills, Releases	CAO / WIPP	On Monday, October 15, 2001 an accidental discharge of a dry chemical automatic fire suppression system occurred. The event was reported to CMR at approximately 1100 hours. Underground mine operations personnel performing routine work reported that the fire suppression system on the Lube Truck (Equip. # 74-U-003) discharged without warning. An investigation revealed that the nitrogen pressure cartridge seal had ruptured due to excessive pressure build up. The root cause was overheating of the cartridge.	\$0.00
Leaks, Spills, Releases	SRO / SRS	Halon discharge due to a mechanical failure of a solenoid valve.	\$0.00
Leaks, Spills, Releases	SRO / SRS	Charging station losses	\$0.00
Leaks, Spills, Releases	CAO / WIPP	On January 9, 2001 the fire suppression system at the underground fuel bay was inadvertently discharged. The dump occurred when an Emergency Service Technician performing a routine inspection and test failed to disconnect the heads to the discharge gas and activated the system at a manually operated pull station. The EST had limited visibility due to the discharge and accidentally flipped the switch from main to reserve causing a second discharge. A total of 2,000 pounds of Purple K dry chemical was discharged.	\$0.00

RECURRING FIRE PROTECTION PROGRAM COSTS

Yearly or recurring fire protection costs for CY 2001 reached \$134,884,834. for the DOE Complex. On a ratio of cost to CAIRS property value (recurring cost rate) , the DOE spent approximately 13.07 cents per \$100 property value for recurring fire protection activities, 0.21 cents more then the previous year.

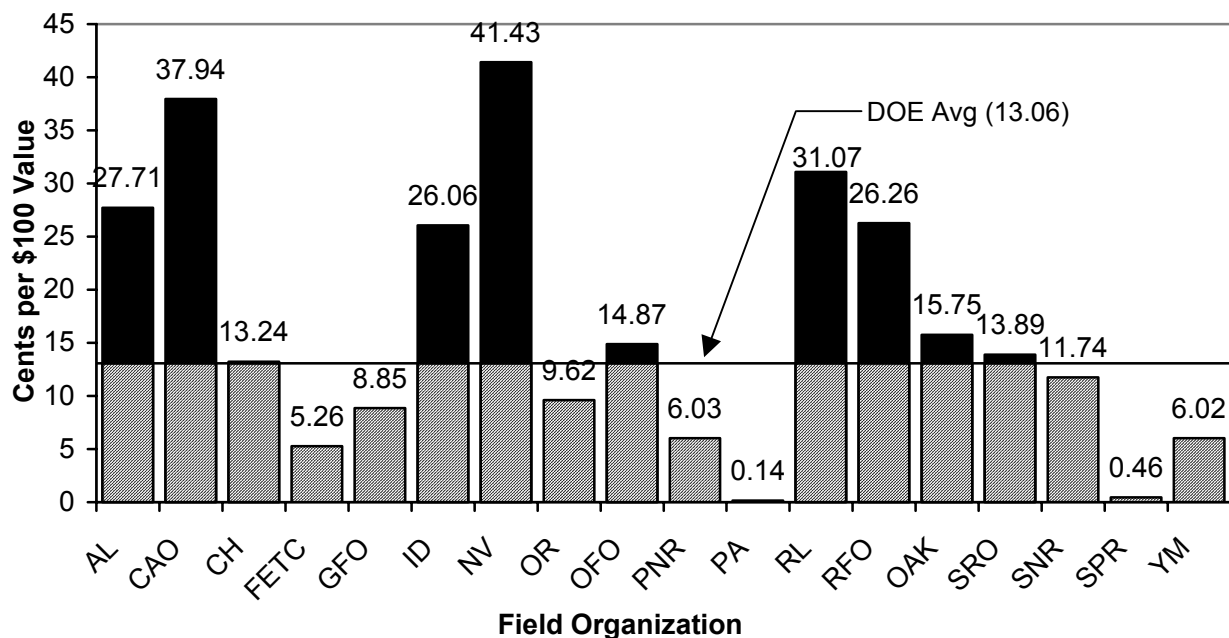
Figure 11 shows the CY 2001 recurring cost distribution by activity. Figure 12 lists the recurring cost rate by DOE field organizations. It should be noted that not all recurring cost activities were consistently reported, such as outside contracts and maintenance activities. Additionally, sites that did not report recurring costs this calendar year (primarily ETTP, MEMP) had their costs carried forward from the past reporting period to maintain the validity of the statistic. Had these costs been omitted from the database, the DOE would have experienced a decrease in the recurring cost amount by approximately \$4,442,196.

Figure 11
Recurring Fire Protection Cost Distribution



* Fire Department Activities

Figure 12
Cost Rate by Operations Office



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The following is a summary of fire department responses for CY 2001. These numbers represent data sent in from approximately 20 of the 22 fire departments stationed at DOE sites.

1. Fire	481
2. Hazardous Materials	332
3. Other Emergency	3,264
4. Other Non-Emergency	2,306
5. Medical	2,661
Total	9,044

Comparing this data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Office of Environment, Safety and Health is examining the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901, "Uniform Coding for Fire Protection" that could be linked to other DOE incident reporting programs for an accurate and cost effective approach to data collection in DOE. Other options, such as folding DOE's fire data collection into State or National programs such as the National Fire Incident Reporting System, are also being considered.

CONCLUSIONS

DOE experienced no fatalities or major injuries from fire in CY 2001. The Annual Summary reporting process has recently been automated to streamline data collection and provide a more thorough review of DOE Reporting Element activities. It is now possible to view all Annual Summary Reporting Element responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels, as well as reference other DOE reporting activities (CAIRS and ORPS) To obtain a copy of the Annual Summary Application please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH-53) at 301.903.6542 or jim.Bisker@hq.doe.gov.